# Soldering Tools for the Ham Shack

Having the right tool at hand makes any job go more smoothly. Nowhere is that truer than in soldering! Here's a guide to the soldering gear that every ham needs.

By Jim Aguirre, WB7DHC*

What should the well-equipped ham shack have in the way of soldering tools? First of all, there's no "one-size-fits-all." A lot depends on the kinds of projects you'll be working on. Let's take a look at some commonly available soldering tools and find out which ones may fit your particular needs. Then, we'll put together a "basic" and an "ideal" soldering tool kit.

## Soldering Tool Basics

There are three basic types of soldering tools suitable for use around the ham shack: "pencils," "guns," and "soldering stations." Each one does a particular type of job well and is best used within those limits (see "What's Watt" for more on this subject).

"Pencils" are low-wattage soldering units with a straight-line design, meaning a hot tip on one end and handle/cord on the other. They're usually found in the 15- to 45-watt heat range. Among the units commonly available are Weller's WP-25 and SP-23 (both 25 watts), and the SP-40 (40 watts). Sears sells two models in its Craftsman line, the #9-54041 (30 watts) and the #9-54042 (45 watts). RadioShack offers several pencils in the 15- to 40-watt range, along with its #640-2055 dual-heat (15/30 watts) unit.

One of the advantages of the soldering pencil is that it can accommodate a variety of different tips, including regular pointed, slender pointed, and chisel. Just having the right tip can sometimes make the difference between a nice, clean solder connection and a botched job. I've also found that making a 30-degree bend near the end of a pointed tip allows me to get into tight spots that are otherwise a real challenge.

*A good basic soldering kit consists of a 100/140-watt gun (upper left), 25-watt pencil (bottom), solder, safety glasses, and spare tips for the gun and pencil. (All photos by the author)*

Solder "guns" are higher wattage soldering tools with a pistol-grip design. They are usually available in the 75- to 400-watt range. Especially useful are the dual-heat guns which provide two levels of heat simply by pulling the trigger back to the second position. Examples are the Weller 8200 (100/140 watts) and D550 (200/260 watts); Sears Craftsman #9-54045 (100/140 watts), #9-54046 (150/250 watts) and #9-27230 (150/400 watts); and the RadioShack #640-2187 (150/230 watts). My personal favorite is the older Weller D550 (240/325 watts) which is no longer available new, but can sometimes be found at hamfests for a reasonable price. My advice is to grab one if you find it. It uses the same tips as the newer D550, so there's no problem there.

Speaking of tips, the ones you'll find on soldering guns are pretty much confined to one style: a chisel point. They're

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definitely not designed for fine work! In addition, for some soldering guns you can get specialty "knife" tips designed for hot-cutting various synthetic ropes and lines (poly, nylon, etc.). They're a handy addition if you use those materials often.

"Solder stations" are the ultimate in convenience for bench work, and they provide true temperature control capability, either by changeable tips or thermostatic controls. They're available in the 30- to 60-watt range and consist of a pencil-type tool attached to a box-like power unit. Solder stations range in price from about $100 to more than $600, so they're definitely not for the faint of pocketbook! Because they are lower-wattage units, they're not well-suited to soldering coax connectors and other heavy work. If you're into building kits or you do a lot of work with circuit boards, you'll probably want to look at soldering stations.

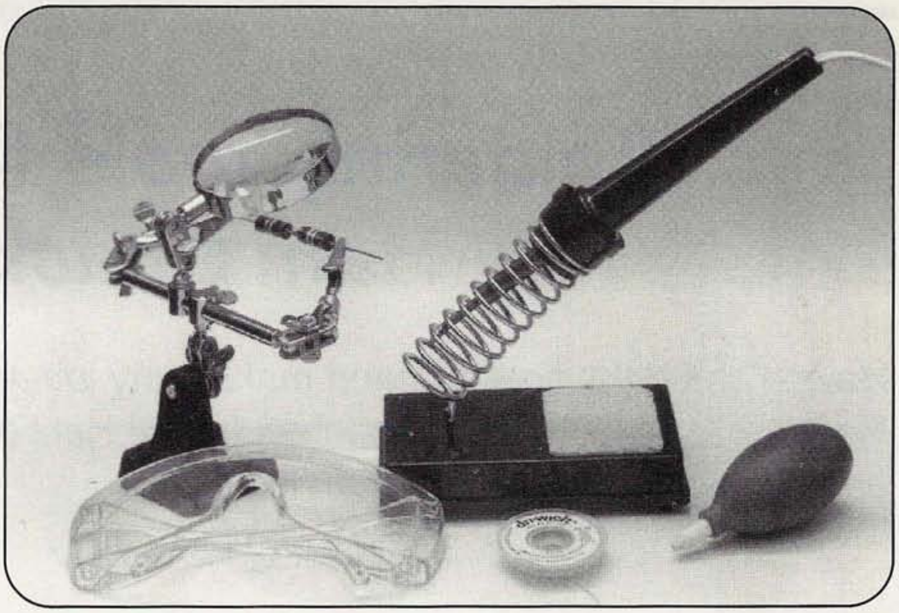
As with all tools, you can find good ones and you can find cheap ones, but it's rare to find a good tool at a cheap price! Buy professional quality tools, or at least a good quality consumer-grade that will last. You'll save money and frustration in the long run.

## Specialty Soldering Tools

In addition to the basic units described above, there are several specialized soldering tools that are quite handy in certain situations. One especially useful item is the gas-heated soldering pencil. It has an adjustable heat range equivalent to a 10- to 60-watt electric pencil and can be used where no electric power is available. It uses readily available butane lighter fuel for heating and can operate for 30 minutes or more on a single charge. Refilling is easy, even out in the field. The Weller Portasol P-1-B and RadioShack Techline (#64-2182) are among the commonly available units of this type. Both also offer several accessory tips as well.

Another handy portable unit is the rechargeable or "cordless" soldering gun. Available in lower wattage units like the Weller Isotip 60 (60 watts), they provide medium-duty soldering capability away from an electric outlet. They're great around the shack, but they must be recharged periodically from 120-VAC power so their use in the field is somewhat limited.

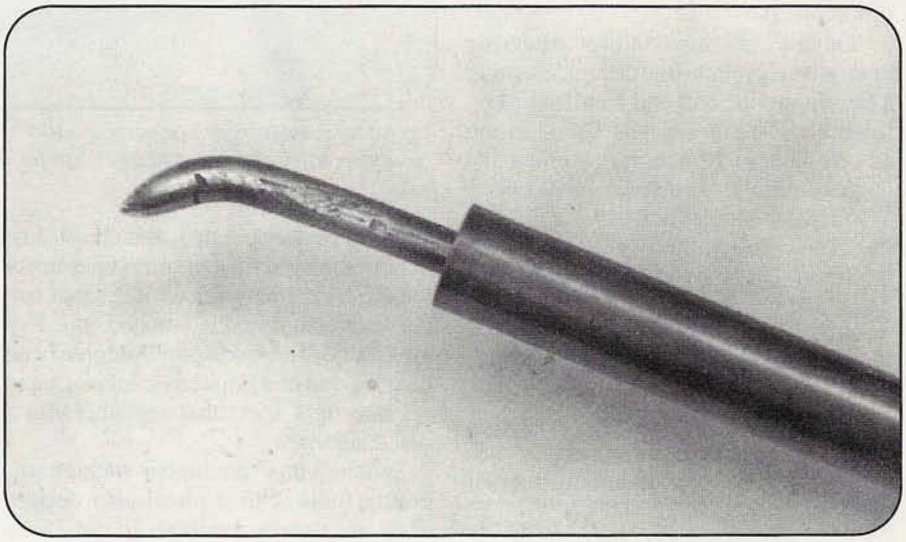
RadioShack's "30-watt mobile" (#64-2105) soldering pencil is yet another portable option to consider. It operates on 12 VDC and plugs into your vehicle's cigarette lighter socket. This little unit might be just the ticket for Field Day or other portable activities.



*Accessories like these make soldering easier and safer. They include (from left to right) a magnifier stand with clip arms, safety glasses (a "must-have"), a pencil-iron holder, a solder wick, and a desoldering bulb.*

## Accessories

There are a number of useful accessories available that make soldering easier, better, and safer. One is a holder or stand to keep your soldering pencil from rolling around and burning everything in sight—including you! It's especially handy when you're doing "dining room table" projects. RadioShack offers one (#64-2078) for less than $7 that also



*Putting a 30-degree bend in the tip on a soldering pencil makes getting into tight spots a bit easier. Be sure to remove the tip from the pencil prior to making the bend to avoid damage to the pencil body.*

## What's Watt?

Higher wattage in a soldering tool means more heating ability, but not necessarily higher temperature! Most soldering equipment, whether a 25-watt pencil or a 250-watt gun, generates temperatures in the 500- to 900-degree Fahrenheit range at the tip (60-40 alloy solder melts at about 365 degrees). However, component leads, wires, circuit board traces, coax connector bodies, etc. all draw heat away from the working point, reducing tip temperature in the process. Higher wattage units will maintain their tip temperatures longer.

For delicate jobs, soldering on circuit boards or around heat-sensitive components (for instance, tip cooling) is not a problem because the materials being joined are small and contact times are short. Here, a low-wattage tool works fine. As a general rule, use no more than 25 to 30 watts for soldering circuit boards and similar items.

General work, such as soldering antenna wires, is best done with a 100-watt gun. With the larger work surfaces involved, tip cooling begins to come into play. This is especially true if you're working outdoors when ambient temperatures are low. Overcoming this without resorting to overly long heating times requires more wattage. In the dead of winter, you may find that an outdoor job will require 250 watts or more, even though the same job could easily be done in July with a 100-watt gun.

As the soldering jobs get even bigger, you'll need still more wattage to maintain the proper tip temperature. For example, you should use a gun rated for at least 140 watts when installing a standard PL-259 connector on coax, a 250-watt unit is even better. Sure, you can use a 75-watt gun and eventually get things hot enough for solder to flow, but you'll melt the coax in the process! Using a higher-wattage gun instead, you can quickly heat the work area, flow the solder, and remove the heat without damaging the coax.

Remember…match the wattage to the job!

includes a sponge for cleaning the tip (be sure to keep the sponge wet!).

Another accessory I find especially useful is a magnifier stand with alligator-clip arms to hold small components (sometimes called a "third hand"). It's really handy to be able to position components and then concentrate on soldering instead of trying to hold everything together with one hand and hit a moving target with a soldering pencil or gun held in the other. I found my magnifier stand at a hamfest, but I've also seen them in hardware and electronics stores.

A somewhat larger accessory that performs a similar function is the Panavise unit with interchangeable heads. The circuit board holder and wide-jaw unit with rubber pads are two of my favorites. I frequently use the rubber-padded unit to hold coax when I'm soldering PL-259 connectors. By clamping the coax loosely in the rubber jaws, it's held steady and can be rotated easily, allowing access to all sides of the PL-259 for soldering.

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The circuit board holder is a "must" if you do much work with pc boards. It consists of two vertical supports that slide in and out on a square bar to accommodate various board sizes. The supports are grooved to hold the circuit board securely in any position from vertical to horizontal, and one is spring-loaded to allow easy removal of the board for inspection or repositioning.

## Reverse Soldering

A couple of other accessories are useful for reversing the soldering process. When you need to "desolder" something, "solder wick" (available in most electronics stores) gathers up molten solder in much the same way as a paper towel picks up spills in the kitchen. Apply it to the molten solder and remove as much as you can, then clip off the saturated portion and repeat as necessary.

There are also "desoldering tools" available. They range from a simple rubber bulb with a high-temperature snout to semi-automatic spring-loaded units and a soldering pencil with a vacuum bulb permanently attached. I use the simple rubber bulb unit; it's cheap and works just fine. Simply heat the solder joint with a pencil or gun, squeeze the bulb, place the snout against the molten solder and allow the bulb to "inhale." It slurps up the solder and deposits it inside the bulb for later removal. RadioShack sells one (#64-2086) for about $3.

A note of caution here: **Never** blow solder out of a joint with air pressure! This is extremely dangerous and can result in a serious eye injury! In addition, it splatters molten solder into places where it shouldn't be, creating potential short circuits and generally wreaking havoc on whatever you're trying to solder.

## And of Course…Solder

The other basic component in the soldering equation is solder itself. For all electronics projects, a good quality rosin core solder in the 60-40 alloy is recommended. Never use acid core, or "plumber's," solder of any kind as it leaves corrosive residues behind.

Several sizes of solder are available, with .062", .050", and .032" being among the most common. The .062"-size is probably best for all-around use while the smaller .032"-size is very handy for fine work. A well-equipped ham shack should probably have both. Buy the half-pound spool; it's a handy size to work with and is less expensive in the long run than smaller quantities.

## The "Basic" Tool Kit

OK, so with all the choices out there, what should you buy first? As noted previously, no single soldering tool does everything well; however, the 100/140 dual-heat gun probably comes the closest. It will do most of the general soldering you'll encounter and, at the 140-watt level, will do a respectable job of soldering things like coax connectors and larger antenna wires in most cases. This should be your first purchase. Next, fill out your basic kit by adding a 25-watt pencil for those smaller jobs and a holder to keep it from rolling around. Be sure to buy spare tips for both.

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Even the "basic" soldering kit is incomplete without safety glasses! Buy a pair and use them! It only takes one splatter of molten solder in the eye to change your life! Don't take the chance.

Finally, don't forget a half-pound spool of .062" rosin core solder in the 60-40 alloy, and a second half-pound spool in the .032" size is highly recommended. You should be able to put this basic kit together for less than $80.

## The "Ideal" Tool Kit?

When putting together the "ideal" soldering tool kit, a lot depends on both your wallet and the kind of work you'll be doing. I'm an antenna builder, occasional kit assembler, and general all-around electronic tinkerer. So, for my money, the ideal complement of soldering tools starts with the basic setup described above and adds a second dual-heat gun in the 150- to 350-watt range for heavy work. Then, I'd slip a butane-heated pencil into my tool kit for Field Day and portable operations.

If you do a lot of kit building or production-type work, you may want to top off the whole thing with a solder station. Don't forget spare tips for all the soldering equipment and a large can of butane lighter fuel for the portable unit.

Accessories are what really "make" the ideal soldering tool kit, however. Add at least some solder wick, a rubber desoldering bulb, and a magnifier stand. I'd also add a Panavise unit with circuit board and wide-jaw heads! Put it all together and there aren't many soldering jobs you can't handle!

Cost for the "ideal" package—not including the solder station or Panavise unit—should be around $200. Add about $120 for the Panavise, including optional circuit board head. A solder station will add an additional $100 to $600.

## Hamfest Bargains

Don't forget to check out the next hamfest for soldering equipment; you may be able to shave a considerable amount off the cost of assembling your tool kit. I frequently find good 100/140 or 240/325 dual-heat soldering guns selling in the $2 to $5 price range at hamfests. Be sure to plug in the unit and check to see that it works. The good thing about a soldering gun is that it either works or it doesn't.

*A good, high-wattage solder gun is best for soldering coax connectors and heavy antenna wires. This early version of the Weller D-550 provides an ideal 240/325 watts of heating power for big jobs. Current models provide 200/260 watts and are still adequate for this work.*

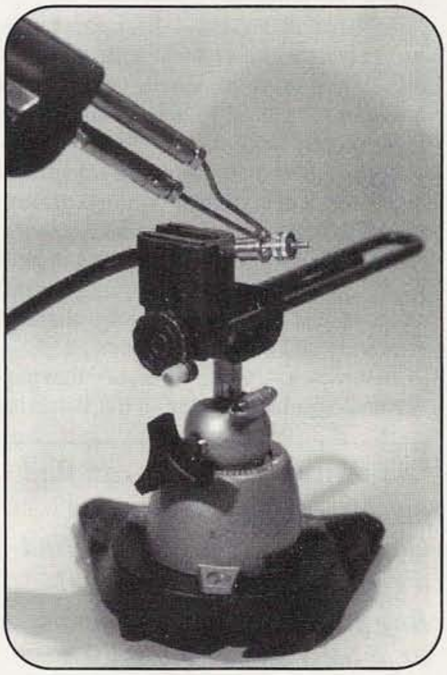
I recently bought one of the older Weller D550 240/325-watt dual heat units at a hamfest for a buck! It worked, but had a cracked case. For about $10, I bought a new case from the local Weller dealer, added a new tip, and came out with one that looked and worked as if it were new—for less than $15. That's about one-third the cost of a new one!

You'll also find used soldering stations being sold at hamfests as well. These, however, are a bit more iffy. Most have been heavily used in a production environment and show it. Unless you find a really clean one from a seller you know (or at least can find again if the unit is defective), be very careful about buying one at a hamfest. Interestingly enough, most of the ones I've seen were priced at not much less than the cost of a new one.

Magnifier stands and Panavise units also show up at hamfests occasionally. I recently found a complete Panavise set, including base, circuit board holder, regular head, and wide-jaw head plus accessory C-clamp mount for $35, all brand new in the box. It always pays to keep your eyes open!

## Wrapping Up

Well, there you have it—a blueprint for the basic soldering tools that every ham needs, with steps for customizing your toolkit according to your interests and your budget. Once you have the tools together, learn the basics of good soldering techniques (if you don't already know them) from an experienced ham or the tips in this magazine, then go out (or is it *in*?) and build something! ■



*A Panavise unit holds larger jobs to make soldering easier. Several different heads are available for the unit, including a circuit board holder.*

# Soldering

Sooner or later, just about every ham needs to solder something. And while you don't have to know how to solder to get your license, it sure does come in handy for getting on the air. Connectors need to be soldered to wires and cables; wires break and need to be fixed, etc. Knowing the right way to solder is important, because poor soldering can cause all kinds of problems, including interference on your neighbor's TV set.

Let's start at the beginning: What type of iron do you need? Most irons are rated for both power and temperature. For amateur work, a 700° F tip is probably best. The wattage of the iron measures how quickly it will heat the surface you're going to solder—what we call the "work." A 45-watt iron is fine for most amateur projects. But it's handy to have a 100-watt soldering gun available when working on large materials and antenna connectors. *(Remember: Pick up a soldering iron* only *by its handle—700 degrees is HOT!)*

You'll also need a stand to hold your iron when you're not soldering, some rosin-core solder (never use acid-core "plumber's" solder), plus a small sponge and some type of solder remover. A vise or something else to hold the work still is also important.

## Be Prepared

Before you start to solder, you need to prepare the tip of your iron for the best heat transfer.This is called "tinning." To prepare a new tip, plug in the iron and let it heat until the tip will melt solder. Then apply a liberal amount of solder all over the tip and a quarter to a half inch down as well. Clean off the excess with a damp sponge. The tip should now be shiny all over, and you are ready to solder.

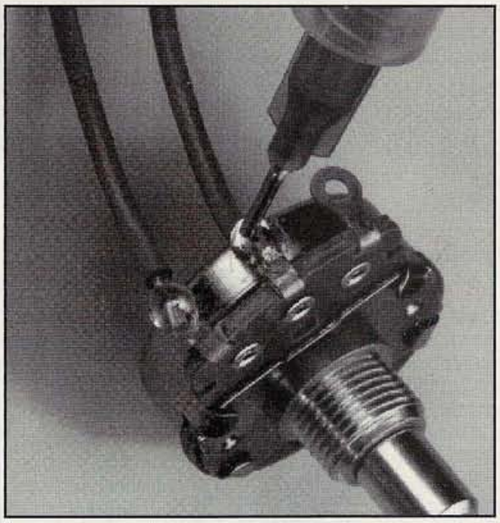
Just keep a couple of rules in mind as you begin your work:

Rule 1. Solder is only for making electrical connections, not for physically holding things together. Make sure you have a good mechanical joint before you solder. Also, make sure the surfaces you're going to solder are clean.

Rule 2. Heat the work, not the solder. If the surface to be soldered isn't hot enough, the solder won't stick or will produce a "cold joint" (more on that later).

## It's Hot!

Hold the soldering iron on an angle; about 45 degrees is best. This puts more of the tip in direct contact with the work—and transfers more heat—than holding it straight down. First, "tin" any wires you're going to solder by applying a small amount of solder to the wire itself. Now, heat the larger mass to make the connection—if you don't, the solder may not adhere to both surfaces.



Here's a hint: If you put a little bit of solder between the tip and the work while it's heating, it'll help maximize heat transfer and will also tell you when the work is ready to solder. The solder starts out balled up on the tip of the iron. When it's hot enough, the solder "wets," or flows into the joint. Now, add more solder. Apply it to the work, not the tip.

## Now Cool It!

When the joint is covered with solder, remove the solder first, then the iron. Clean off the tip with your damp sponge and put the iron in its holder. Now let the joint cool. Don't try to rush things. It usually takes a solder joint no more than 10 seconds to cool. If you move it or blow on it before it's cool, you'll cause a cold joint and you'll have to start again. Your finished joint should be shiny and smooth. You should be able to see the outline of the materials you've joined, and the solder itself should have a feathered, tapered shape.

## Cool, Not Cold

If the joint looks dull and grainy, you've got a "cold solder joint." The solder here is brittle, may be a poor conductor, and will eventually fall apart. To "warm up" a cold solder joint, reheat the connection until the solder melts, then add a small amount of fresh solder and let it cool slowly.

Finally, check your connections with a V-O-M (volt-ohm meter) to make sure there are no shorts and that you have a solid connection to whatever's on the other end of what you've soldered. Use the "ohms" setting. On the meter, look for zero resistance in your continuity check and for infinite resistance when checking for shorts.

## All Done!

It's really not that hard to solder well. In fact, if you're using the right iron and tip, have prepared the tip and work properly, and have the patience to wait while your work heats and then cools, soldering can be easy and fun.